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Manual of Agriculture for Secondary Schools: Studies in Soils and Crop-Production. By D. O. BARTO. With an Introduction by E. DAVENPORT. Boston: D. C. Heath & Co., 1910. Pp. xiv+89. \$0.50.

There may be a difference of opinion as to whether agriculture should be regarded as a science, a combination of sciences, or something else; but one must marvel at the spread of this latest study of scientific character to knock for admission into the high-school curriculum. Where four years ago the number of high schools teaching agriculture was less than one hundred, it now runs into four figures. Of grammar-school texts we already have warnings of the flood to come. Few texts suitable for high-school classes, however, have appeared, and they have been of a general nature.

This little work is the first serious effort, outside of certain official publications, to furnish a complete set of field and laboratory exercises to guide the practical work of high-school classes in agriculture. Part I, on soils, includes twenty exercises, and Part II, on crops, has sixteen. The thirty-six exercises are intended to furnish material for an entire year's work, which they undoubtedly would do. Some are easily within the grasp of first-year pupils, but many others require a precision of manipulation, the lack of which has been the despair of so many teachers of the physical sciences in the third and fourth years. The author makes no suggestion as to the place in the high-school course the work is intended to occupy, other than to remark that it should precede another year's work on animal husbandry, pests, and kindred topics. The experiments do not follow in such close sequence as to preclude the order's being occasionally changed. While some of the exercises might be conducted by any teacher of fair scientific attainment, it would hardly be safe for one to attempt to carry a class through the entire set unless he had had the advantage of agricultural-college training. In other words, the work here undertaken is of a serious nature and not at all comparable with the tomato-can sort of demonstration work first used to popularize "school agriculture." Some of the apparatus called for will be found in the science equipment already possessed, but agricultural study calls for its own peculiar apparatus as truly as do the standard sciences. A fair-sized plot of ground is also necessary for the outdoor work.

Each exercise has a concise introductory statement, though to be intelligible the work should be accompanied or preceded by some physics and chemistry; if not by the regular high-school courses, then by supplementary work of the "elementary" or "introductory" variety of science. In only a few instances does the pupil have thrown at him without some preparation such terms as *osmosis* and *flocculation*. But the three-page discussion of the common elements and their compounds related to plant economy is hardly sufficient to give the mastery of their nature desirable in the investigation of plant foods and fertilizers. This is not a fault of the book but is incidental to the chaos still reigning in our ideas about the administration of agricultural education.

While considerable information is afforded by the discussions, the book makes no pretense of being a text, and abundant references are given at the close of each section. These are necessarily to the books used in the agricultural colleges. Indeed, the author's statement that many of the exercises are those

used in the colleges is an admission that much of the work of the agricultural colleges is still of secondary-school grade.

The author certainly deserves much credit for the performance of this pioneer work.

Tillers of the Ground. By MARION I. NEWBIGIN. London: Macmillan, 1910. Pp. vi.+224. \$0.50.

This is an interesting little work by a versatile British scientist, written in a simple style within the understanding of elementary-school children, and adapted for use to supplement work in geography, nature-study, and elementary agriculture. It deals not only with *tillers*, both savage and civilized, but with man's continual contest with nature, from his crudest efforts to the latest developments of science. The book is well fitted to furnish a "human interest" element to high-school botany where lack of time prevents reference to original sources.

Report of the Board of Education of Massachusetts on Agricultural Education. Boston: Wright & Potter Printing Co., 1911. Pp. 104.

State reports vary in nature. They may be descriptive, statistical, or made up of scattered reports, addresses, proceedings of educational meetings, and the like. Occasionally they embody results of extensive investigations, upon which are based recommendations of a constructive nature.

The report at hand is of the last sort. Pursuant to a resolution of the legislature, the investigation was undertaken by Commissioner of Education David S. Snedden, Deputy Commissioner Charles A. Prosser, and Special Agent Rufus W. Stimson. Hearings were held in many parts of the state and advice was sought from a large number of experts outside the state.

The report sets forth many facts about farming conditions in the state and the effects on values and output already resulting from improved methods. It considers the factors involved in the establishment of a system of secondary education in agriculture, such as minimum requirements in the way of locality, plant, equipment, support and control, admission and promotion, courses and methods of instruction, and the teaching staff. Social and economic factors also receive considerable attention.

Of most general interest, doubtless, are some of the recommendations. Schools with boarding departments are considered unnecessary for Massachusetts. Special schools in the more densely populated districts should be accessible to at least a hundred pupils by the ordinary means of transportation, while the needs of the more sparsely settled communities should be met by establishing special departments in existing high schools.

The work should consist of definite "projects"; that is, it should center about a series of well-organized problems. These are formulated for the entire four years, and represent the last and best pronouncement by the experts collaborating in the preparation of the report. A few of these projects are outlined in much detail to show the subsidiary propositions involved. They are so graded for the four years that they might well serve as a model for the organization of